Lecture 13: Theory of Asset Pricing IV
Asset Price Bubbles

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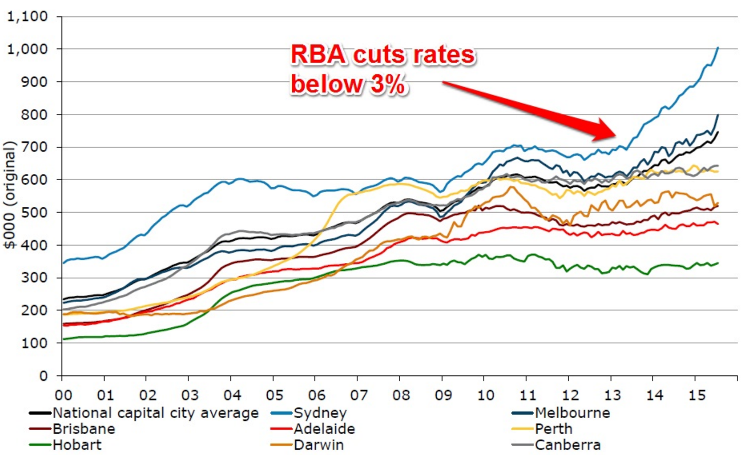
Advanced Financial Economics 2020

Roadmap

1. Introduction
2. Symmetric Information
3. Asymmetric Information
4. Conclusion

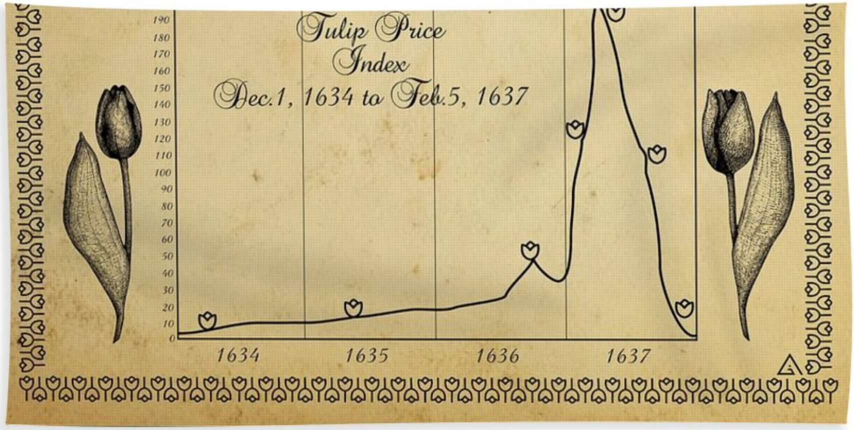
Motivation

FIGURE 2. DIVERGENCE ACROSS STATES AND TERRITORIES BROADENS



Source: RP Data, ANZ Research

Motivation


Tulip Price
Index
Dec.1, 1634 to Feb.5, 1637
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
1634
1635
1636
1637

Motivation

- The market for North American-trained economics Ph.D. graduates.
- Some of my friends from Wisconsin:
  - Mr. Pink: consulting firm ($300,000 USD/year plus bonuses).
  - Mr. Blond, Mr. Blue and Mr. White: tech company ($200,000 USD/year plus stock options).
  - Mr. Green: investment bank ($250,000 USD per year).
- Really...?
- There are always exceptions obviously: yours truly still drinks Tesco-brand wine.

Motivation

- We'll define bubbles as when an asset's price exceeds its fundamental value.
- What's an asset's fundamental value?
- Are bubbles rational?
- When do they happen?

Motivation

- Neoclassical v.s. behavioural economics.
- Do bubbles come about in the presence of rational agents or not?
- When else might they come about?

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Setup

- Consider the infinite-horizon consumption-savings problem with a risky asset and a risk neutral agent.
- What does this mean in terms of utility function? A risk neutral agent?

Solution

- Household solves the problem

$$\max_{\{c_t, a_{t+1}\}_{t=0}^{T}} \quad \mathbb{E}_0 \sum_{t=0}^{T} \beta^t c_t$$

subject to

$$c_t + p_t a_{t+1} \leq (p_t + d_t) a_t + y_t$$

where $y_t \geq 0$ is the investor's endowment of income for the period.

Solution

- Euler equation given by

$$1 = \beta \mathbb{E}_t \left[\frac{p_{t+1} + d_{t+1}}{p_t} \right]$$

Solution

- Iterate forwards on the Euler equation

$$
\begin{aligned}
p_{t+1} &= \beta \mathbb{E}_{t+1} \left[p_{t+2} + d_{t+2} \right] \\
\Rightarrow p_t &= \beta \mathbb{E}_t \left\{ d_{t+1} + \beta \mathbb{E}_{t+1} \left[p_{t+2} + d_{t+2} \right] \right\} \\
\Rightarrow p_t &= \mathbb{E}_t \sum_{s=1}^{T-t} \beta^s d_{t+s} + \beta^{T-t} \mathbb{E}_t \left[p_T \right]
\end{aligned}
$$

Finite v.s. Infinite Horizon

- Recall

$$p_t = \mathbb{E}_t \sum_{s=1}^{T-t} \beta^s d_{t+s} + \beta^{T-t} \mathbb{E}_t \left[p_T \right].$$

- Notice that if we have $T < \infty$, then $\mathbb{E}_t \left[p_T \right] = 0$ as the asset dies at the end of time.

- Not so obvious when it comes to the infinite limit, however.

Finite v.s. Infinite Horizon

- To rule-out bubbles, we need the so called transversality condition to hold

$$\lim_{T \to \infty} \beta^{T-t} \mathbb{E}_t [p_T] = 0$$

- This need not hold though!

Finite v.s. Infinite Horizon

- We're considering a difference equation.
- Any solution can be decomposed as

$$p_t = \underbrace{\mathbb{E}_t \sum_{s=1}^{T-t} \beta^s d_{t+s}}_{\text{Fundamental value}} + b_t \tag{1}$$

which are the fundamental value (PV of dividends) and the bubble component respectively.

- Where [you need not show this], it must be that

$$b_t = \mathbb{E}_t \left[\beta b_{t+1}\right].$$

Finite v.s. Infinite Horizon

- $p_t = \mathbb{E}_t \sum_{s=1}^{T-t} \beta^s d_{t+s}$ is only one solution to the equation (1).
- A non-zero value of b_t reflects the existence of a rational bubble.
- A self-confirming belief that the bubble's price doesn't conform to the fundamental value.

Finite v.s. Infinite Horizon

- But this is weird...why?
- There is some asset that trades for a price above what it delivers to us in future dividends.
- This only happens because agents know it will have the bubble component still in the future.
- Will be able to sell the asset for a price above fundamental value.
- This is kinda scary stuff...
- People paying more than something is worth because they think it will still be the case in the future.

Finite v.s. Infinite Horizon

- For this to be a solution, what restrictions must we place on b_{t+1}?
- For the price $\lim_{t\to\infty} p_t < \infty$, we need for the bubble component to grow at the same rate as the discount factor.
- I.e. if $\beta = \frac{1}{1+r}$, then b_t must grow at rate $r > 0$.

Finite v.s. Infinite Horizon

- Why do I not refer to the case where $b_t \to \infty$ as a bubble solution?
- An infinite number isn't a solution, (it's undefined by definition).
- Bubbles here happen when an asset's price sits above its fundamental value.

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Intuition

- What if some people have information that others do not?
- What role do prices play here?
- Prices reveal scarcity of the resource as well as revealing information about other traders' information.
- Lots of different equilibria can be sustained in these models, provided that people remain asymmetrically informed even after inferring things from observing prices.
- If I suddenly learn that an asset is over-valued, then I won't trade for it anymore at the prevailing price: equilibrium breaks-down.

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Takeaways

- In infinite time models, rational bubbles can emerge.
- In the symmetric information case, it's all about the limit term on the price!
- With differential information, it's more about people being in the dark and staying there!